WHAT IS CLAIMED IS:

1. In a digital information processing system wherein a model of a finite state machine (FSM) receives a plurality of FSM inputs and produces a plurality of FSM outputs, a method for updating soft decision information on said FSM input symbols into higher confidence information, the method comprising:

(a) inputting said soft decision information in a first index set;

(b) combining said input soft decision information with knowledge regarding said finite state machine;

(c) outputting said higher confidence information;

(d) modifying said input soft decision information using said output higher confidence information via a feedback path; and

(e) repeating steps (a) to (d) until a termination condition is met.

2. In a digital information processing system wherein a model of a finite state machine (FSM) receiving a plurality of FSM inputs and producing a plurality of FSM outputs is represented by a reduced-state trellis and wherein said FSM inputs are defined on a base closed set of symbols, a method for updating soft decision information on said FSM inputs into higher confidence information, the method comprising:

(a) inputting said soft decision information in a first index set;

(b) processing a forward recursion on said input soft decision information based on said reduced-state trellis representation to produce forward state metrics;

(c) processing a backward recursion on said input soft decision information based on said reduced-state trellis representation to produce backward state metrics, wherein said backward recursion is independent of said forward recursion;

(d) operating on said forward state metrics and said backward state metrics to produce said higher confidence information; and

(e) outputting said higher confidence information.

3. The method of claim 2, further comprising the steps of:

(f) modifying said input soft decision information using said output higher confidence information via a feedback path; and

(g) repeating steps (a) to (f) until a termination condition is met.

4. The method of claim 2, wherein said operating comprises at least one of the following operations: summing, multiplication, minimum, maximum, minimum*, maximum*, linear weighting and exponentiation.

5. The method of claim 2, wherein the step of forward recursion processing includes the steps of:

using residual state information to augment reduced-state trellis information to produce said forward state metrics; and

updating said residual state information.

6. The method of claim 2, wherein the step of backward recursion processing includes the steps of:

using residual state information to augment reduced-state trellis information to produce said backward state metrics; and

updating said residual state information.

7. The method of claim 5, wherein said residual state information is a plurality of decisions on said FSM inputs.

8. The method of claim 6, wherein said residual state information is a plurality of decisions on said FSM inputs.

9. The method of claim 7, wherein said decisions on said FSM inputs are defined on a revised closed set of symbols, wherein said revised closed set of symbols is a partitioning of said base closed set of symbols.

10. The method of claim 8, wherein said decisions on said FSM inputs are defined on a revised closed set of symbols, wherein said revised closed set of symbols is a partitioning of said base closed set of symbols.

11. The method of claim 2, wherein the digital information processing system is operative to perform at least one of the following functions:

iterative detection;

iterative decoding;

turbo detection;

turbo decoding;

message passing; and

belief propagation.

12. The method of claim 2, wherein said finite state machine is operative to model at least one of the following:

a communication medium;

a storage medium; and

an imaging medium.

13. The method of claim 2, wherein said finite state machine is operative to model at least one of the following:

allowable input and output pairs of a forward error correction code; and

a forward error correction encoder.

14. The method of claim 2, wherein said finite state machine is operable to model a composite signal comprising at least one desired signal and at least one interference signal.

15. In a digital information processing system wherein a model of a finite state machine (FSM) receiving a plurality of FSM inputs and producing a plurality of FSM outputs is represented by a reduced-state trellis and wherein said FSM inputs are defined on a base closed set of symbols, a method for updating soft decision information on said FSM inputs into higher confidence information, the method comprising:

(a) inputting said soft decision information in a first index set;

(b) processing a forward recursion on said input soft decision information based on said reduced-state trellis representation to produce forward state metrics and forward transition metrics;

(c) processing a backward recursion on said input soft decision information based on said reduced-state trellis representation to produce backward state metrics and backward transition metrics, wherein said backward recursion is independent of said forward recursion;

(d) operating on said forward state metrics, said forward state transition metrics, said backward state metrics and said backward state transition metrics to produce said higher confidence information; and

(e) outputting said higher confidence information.

16. The method of claim 15, further comprising the steps of:

(f) modifying said input soft decision information using said output higher confidence information via a feedback path; and

(g) repeating steps (a) to (f) until a termination condition is met.

17. The method of claim 15, wherein said operating comprises at least one of the following operations: summing, multiplication, minimum, maximum, minimum*, maximum*, linear weighting and exponentiation.

18. The method of claim 15, wherein the step of forward recursion processing includes the steps of:

using residual state information to augment reduced-state trellis information to produce said forward state metrics; and

updating said residual state information.

19. The method of claim 15, wherein the step of backward recursion processing includes the steps of:

using residual state information to augment reduced-state trellis information to produce said backward state metrics; and

updating said residual state information.

20. The method of claim 18, wherein said residual state information is a plurality of decisions on said FSM inputs.

21. The method of claim 19, wherein said residual state information is a plurality of decisions on said FSM inputs.

22. The method of claim 20, wherein said decisions on said FSM inputs are defined on a revised closed set of symbols, wherein said revised closed set of symbols is a partitioning of said base closed set of symbols.

23. The method of claim 21, wherein said decisions on said FSM inputs are defined on a revised closed set of symbols, wherein said revised closed set of symbols is a partitioning of said base closed set of symbols.

24. The method of claim 15, wherein the digital information processing system is operative to perform at least one of the following functions:

iterative detection;

iterative decoding;

turbo detection;

turbo decoding;

message passing; and

belief propagation.

25. The method of claim 15, wherein said finite state machine is operative to model at least one of the following:

a communication medium;

a storage medium; and

an imaging medium.

26. The method of claim 15, wherein said finite state machine is operative to model at least one of the following:

allowable input and output pairs of a forward error correction code; and

a forward error correction encoder.

27. The method of claim 15, wherein said finite state machine is operable to model a composite signal comprising at least one desired signal and at least one interference signal.

28. The method of claim 15, wherein the digital information processing system is a system performing iterative detection, iterative decoding, turbo detection, turbo decoding, message passing, or belief propagation.

29. A digital information processing system for updating soft decision information into higher confidence information by representing a model of a finite state machine (FSM) receiving a plurality of FSM inputs and producing a plurality of FSM outputs as a reduced-state trellis, wherein said FSM inputs are defined on a base closed set of symbols, the system comprising:

means for inputting said soft decision information in a first index set;

means for processing a forward recursion on said input soft decision information based on said reduced-state trellis representation to produce forward state metrics;

means for processing a backward recursion on said input soft decision information based on said reduced-state trellis representation to produce backward state metrics, wherein said backward recursion is independent of said forward recursion;

means for operating on said forward state metrics and said backward state metrics to produce said higher confidence information; and

means for outputting said higher confidence information.

30. A digital information processing system for updating soft decision information into higher confidence information by representing a model of a finite state machine (FSM) receiving a plurality of FSM inputs and producing a plurality of FSM outputs as a reduced-state trellis, wherein said FSM inputs are defined on a base closed set of symbols, the system comprising:

means for inputting said soft decision information in a first index set;

means for processing a forward recursion on said input soft decision information based on said reduced-state trellis representation to produce forward state metrics and forward state transition metrics;

means for processing a backward recursion on said input soft decision information based on said reduced-state trellis representation to produce backward state metrics and backward state transition metrics, wherein said backward recursion is independent of said forward recursion;

means for operating on said forward state metrics, said forward state transition metrics, said backward state metrics and said backward state transition metrics to produce said higher confidence information; and

means for outputting said higher confidence information.

31. A digital information processing device for updating soft decision information into higher confidence information by representing a model of a finite state machine (FSM) receiving a plurality of FSM inputs and producing a plurality of FSM outputs as a reduced-state trellis, wherein said FSM inputs are defined on a base closed set of symbols, the device comprising:

a plurality of device inputs for inputting said soft decision information in a first index set;

a plurality of processing units for processing a forward recursion on said input soft decision information based on said reduced-state trellis representation to produce forward state metrics, processing a backward recursion on said input soft decision information based on said reduced-state trellis representation to produce backward state metrics, wherein said backward recursion is independent of said forward recursion, and operating on said forward state metrics and said backward state metrics to produce said higher confidence information; and

a plurality of device outputs for outputting said higher confidence information.

32. A digital information processing device for updating soft decision information into higher confidence information by representing a model of a finite state machine (FSM) receiving a plurality of FSM inputs and producing a plurality of FSM outputs as a reduced-state trellis, wherein said FSM inputs are defined on a base closed set of symbols, the device comprising:

a plurality of device inputs for inputting said soft decision information in a first index set;

a plurality of processing units for processing a forward recursion on said input soft decision information based on said reduced-state trellis representation to produce forward state metrics and forward state transition metrics, processing a backward recursion on said input soft decision information based on said reduced-state trellis representation to produce backward state metrics and backward state transition metrics, wherein said backward recursion is independent of said forward recursion, and operating on said forward state metrics, said forward state transition metrics, said backward state metrics and said backward state transition metrics to produce said higher confidence information; and

a plurality of device outputs for outputting said higher confidence information.